WC-15J

MEMORANDUM

DATE: December 13, 2018

SUBJECT: EPA Northeast Juneau County Groundwater Investigation Data Analysis - Relationships between Nitrate in Groundwater and Potential Sources

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I. INTRODUCTION

This memo presents data analysis based on the results of an investigation summarized in EPA's August 30, 2018, Northeast Juneau County Groundwater Investigation *Sampling Inspection Report* ("Inspection Report") (EPA, 2018). The Inspection Report provided a description of EPA investigations related to potential sources of nitrate contamination in groundwater in northeast Juneau County, Wisconsin. The study area encompasses approximately 30 square miles, mostly within the Town of Armenia. The Inspection Report also included the results of the various sampling and inspection efforts, including the groundwater study conducted by EPA in northeast Juneau County during the week of April 30, 2018. This memo summarizes EPA's evaluation of the groundwater data collected as part of the groundwater study.

The groundwater study effort was in response to citizen complaints regarding concerns about elevated levels of nitrates in residential wells in northeast Juneau County. The purpose of the groundwater study was to investigate potential sources of nitrate contamination in the groundwater and in residential drinking water wells. The study focused on potential nitrates sources including crop fields, Central Sands Dairy (CSD), a large concentrated animal feeding operation, residential septic systems, and cranberry fields. EPA relied on a combination of

standard analytical methods and research methods to meet the data collection and analysis goals of the groundwater study. The details regarding EPA's sampling design for the groundwater study are included in the Inspection Report.

The importance of EPA's efforts in this area was reinforced by the results of a residential well sampling study conducted in May 2018 by the Juneau and Wood County Health Departments and Land and Water Resource Departments, in conjunction with the University of Wisconsin-Stevens Point. The counties sampled 104 residential wells as part of the survey and reported that 41% of the wells tested had nitrate levels exceeding the drinking water standard of 10 mg/l. The counties issued a press release on June 15, 2018, providing a summary of the survey results and warning residents of risks related to nitrates (Juneau and Wood County Health Department, 2018). The press release also mentioned that the "percent of wells observed with high nitrate levels, through this survey, is greater than the estimated statewide average of 9% of wells."

II. STUDY SCOPE

As discussed above, the purpose of the groundwater study was to investigate potential sources of nitrate contamination in the groundwater and in residential drinking water wells in the Town of Armenia, Wisconsin. EPA Region 7 assisted with the investigation by providing a direct-push boring technology hydraulic sampling machine, called a Geoprobe®, and two trained operators. Each groundwater sample collected with the Geoprobe® was located within a road right-of-way. The field investigation portion of the study began on April 30, 2018, and consisted of the following:

- Collection of groundwater samples (at two depths) from 41 temporary boring locations installed with a Geoprobe®. A total of 82 samples were collected for laboratory analysis.
- Pre-screening of the groundwater samples using Hach Nitrate Test strips, and a Fisher Scientific Accumet Waterproof Hand-held meter (A-85) for pH/ temperature.

EPA Region 5 scientists mapped five transects in the study area, identified as A through E. Transect A was designed to characterize the groundwater upgradient of crop fields and downgradient of cranberry fields and other potential sources upgradient of the CSD facility and nearby crop fields. The remaining transects (B-E) were designed to characterize groundwater both downgradient and upgradient of potential sources including, the CSD facility, crop fields, and cranberry fields. The location of the study area, including the temporary groundwater sample locations, direction of regional groundwater flow, and potential nitrate sources such as crop fields, the CSD facility, and cranberry fields, is shown in Figure A-1 (Appendix A).

For each Geoprobe® location, groundwater grab samples were collected at two depth intervals (ranging from 20-34' and 36-49' below ground surface), via a dedicated tube inserted into the Geoprobe® casing and down to a four-foot long retractable screen at the bottom of the casing. Prior to sample collection, the Geoprobe® operators pumped approximately one gallon of water out through the tubing to reduce the turbidity in the samples collected. Samples were collected for field analysis, including pH and temperature, and for nitrate analysis using the Hach Nitrate test strips. Samples collected for nutrients (total phosphorus, ammonia-nitrogen, total kjeldahl nitrogen, nitrate-nitrite nitrogen, total organic carbon), total metals, anions (bromide, chloride, fluoride, nitrate, and sulfate), and total dissolved solids, were analyzed by the EPA Chicago